

alry, Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant John P. Finley, Signal Corps.

*Percentages of forecasts verified, December, 1890.*

States.		States.	
Maine.....	81.9	Kentucky.....	84.6
New Hampshire.....	84.2	Ohio.....	81.4
Vermont.....	86.1	West Virginia.....	85.4
Massachusetts.....	79.9	Indiana.....	79.2
Rhode Island.....	83.2	Illinois.....	88.4
Connecticut.....	83.2	Lower Michigan.....	74.9
Eastern New York.....	84.8	Upper Michigan.....	72.6
Western New York.....	74.3	Wisconsin.....	84.4
Eastern Pennsylvania.....	83.8	Minnesota.....	88.8
Western Pennsylvania.....	79.4	Iowa.....	86.6
New Jersey.....	85.3	Kansas.....	86.1
Delaware.....	86.7	Nebraska.....	82.8
Maryland.....	86.7	Missouri.....	84.5
District of Columbia.....	87.0	Colorado.....	84.3
Virginia.....	85.5	North Dakota.....	86.6
North Carolina.....	84.3	South Dakota.....	85.0
South Carolina.....	81.4	Southern California*.....	90.9
Georgia.....	81.9	Northern California*.....	89.1
Eastern Florida.....	85.7	Oregon*.....	86.8
Western Florida.....	84.1	Washington*.....	85.0
Alabama.....	91.4	By elements: Weather.....	85.7
Mississippi.....	91.5	Temperature†.....	81.2
Louisiana.....	89.7	Monthly percentage of weather and temperature combined ‡.....	83.9
Texas.....	82.8		
Arkansas.....	79.5		
Tennessee.....	82.2		

\* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The forecasts of temperature in districts east of the Rocky Mountains for December, 1890, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡ The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

## WIND SIGNALS FOR DECEMBER, 1890.

Statement showing percentages of justifications of wind signals for the month of December, 1890:

Wind signals.—(Ordered by Captain James Allen.) Total number of signals ordered, 95; justified as to velocity, wholly, 70, partly, 12; justified as to direction, 93. Of the signals ordered 49 were cautionary, of which 33 were wholly and 7 partly justified; and 46 were storm signals, of which 37 were wholly and 5 partly justified. 20 signals were ordered for easterly winds, of which 18 were justified, and 75 were ordered for westerly winds, all of which were justified. Percentage of justifications, 77.5.

## COLD-WAVE SIGNALS AND TEMPERATURE-FALL WARNINGS.

[Ordered by Assistant Professor T. Russell.]

Number of cold-wave signals ordered, 156; justified, 102. Percentage of justifications, 65.4. Number of temperature-fall warnings, 119. Percentage of justifications, 61.3. Percentage of justifications of cold-wave signals and temperature-fall warnings combined, 64.3.

Percentages of verifications of weather and temperature signals reported by directors of the various State Weather Services for December, 1890.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Iowa.....	92	93	Nebraska.....	87	86
Illinois.....	87	85	New Jersey.....	83	87
Michigan.....	88	88	North and South Dakota.....	82	82
Minnesota.....	79	85	Ohio.....	88	88
Missouri.....	84	85	Pennsylvania.....	82	84

## STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for December, 1890, of the directors of the various state weather services:

### ALABAMA.

Temperature.—Maximum, 91, at Brewton, 5th; minimum, 20, at Valley Head, 4th, 28th, and 29th, and at Citronelle, 9th; greatest monthly range, 68, at Brewton; least monthly range, 39, at Chattanooga, Tenn.

Precipitation.—Greatest monthly, 3.97, at Double Springs; least monthly, 1.35, at Bermuda.

Wind.—Prevailing direction, northwest.—Prof. P. H. Mell, Auburn, director; J. M. Quarles, Private, Signal Corps, assistant.

### ARKANSAS.

Temperature.—The mean was 2.1 above the normal; maximum, 78, at Texarkana, 24th; minimum, 2, at Lead Hill, 9th; greatest monthly range, 74, at Lead Hill; least monthly range, 44, at Conway and Dallas.

Precipitation.—The average was about 1.26 below the normal; greatest monthly, 5.12, at Winslow; least monthly, 1.70, at Texarkana.

Wind.—Prevailing direction, north.—M. F. Locke, Commissioner of Agriculture, Little Rock, director; F. H. Clarke, Sergeant, Signal Corps, assistant.

### COLORADO.

Temperature.—Maximum, 87, at Bennet, 10th; minimum, —21, at Breckenridge, 8th; greatest monthly range, 93, at Breckenridge; least monthly range, 30, at Monte Vista.

Precipitation.—Greatest monthly, 5.40, at Cumbres; least monthly, 0.00, at several stations.—W. S. Miller, Sergeant, Signal Corps, Denver, assistant.

### ILLINOIS.

Temperature.—The mean was 3.0 above the normal; maximum, 63, at Cairo, 1st; minimum, —2, at Aurora, Belvidere, and Sycamore, 4th.

Precipitation.—The average was 1.78 below the normal; greatest monthly, 2.91, at Cairo; least monthly, 0.03, at Keokuk, Iowa.

Wind.—Prevailing direction, northwest.—John Craig, Sergeant, Signal Corps, Springfield, in charge.

### INDIANA.

Temperature.—Maximum, 69, at Jeffersonville, 21st; minimum, 2, at Maury and Point Isabel, 28th; greatest monthly range, 62, at Princeton and Warrington; least monthly range, 82, at Columbia City.

Precipitation.—Greatest monthly, 3.86, at Cannelton; least monthly, 0.23, at La Fayette.

Wind.—Prevailing direction, southwest.—Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.

### IOWA WEATHER AND CROP SERVICE.

Temperature.—The mean was 6.5 above the normal; maximum, 72, at Glenwood, 10th; minimum, —18, at West Bend, 8th; greatest monthly range, 80, at Eagle Grove; least monthly range, 42, at Fort Madison.

Precipitation.—The average was about 1.00 below the normal; greatest monthly, 1.40, at West Bend; least monthly, 0.00, at Logan and Glenwood.

Wind.—Prevailing direction, northwest.—J. R. Sage, Des Moines, director; G. M. Chappel, Sergeant, Signal Corps, assistant.

### KANSAS.

Temperature.—The mean was about 5.0 above the normal; maximum, 82, at Horton, 22d; minimum, —3, at Lakin, 7th; greatest monthly range, 74, at Horton; least monthly range, 48, at Morse.

Precipitation.—The average was 0.52 below the normal; greatest monthly, 2.00, at Oswego; least monthly, 0.00, at several stations.

Wind.—Prevailing direction, southwest.—Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.

### KENTUCKY.

Temperature.—The mean was less than 1 above the normal; maximum, 70, at Earlington, 1st; minimum, 12, at Shelbyville and Richmond, 28th; greatest monthly range, 50, at Frankfort and Princeton; least monthly range, 38, at Central City and Franklin.

Precipitation.—The average was about 1.00 below the normal; greatest monthly, 4.27, at Franklin; least monthly, 2.14, at Mount Sterling.

Wind.—Prevailing direction, southwest.—Dr. E. A. Grant, Louisville, director; Frank Burke, Sergeant, Signal Corps, assistant.

### LOUISIANA.

Temperature.—Maximum, 82, at Melville, 7th, and at Plaquemine, Cameron, and Thibodeaux, 6th; minimum, 21, at Liberty Hill, 9th; greatest monthly range, 58, at Plaquemine; least monthly range, 37, at Port Eads.

Precipitation.—Greatest monthly, 6.08, at Amite City; least monthly, 1.07, at New Iberia.

Wind.—Prevailing direction, north.—George E. Hunt, Sergeant, Signal Corps, New Orleans, in charge.

### MICHIGAN.

Temperature.—The mean was 1.6 below the normal of the last 15 years; maximum, 55, at Hanover 1st, and at Grape, 10th; minimum, —17, at Hillman, 7th; greatest monthly range, 62, at Hillman; least monthly range, 28, at Colon.

**Precipitation.**—The average was 1.38 below the normal of the last 15 years; greatest monthly, 3.80, at Charlevoix; least monthly, 0.52, at West Branch.  
**Wind.**—Prevailing direction, northwest.—*N. B. Couger, Sergeant, Signal Corps, Lansing, director.*

## MINNESOTA.

**Temperature.**—Maximum, 55, at Mankato, 22d; minimum, -27, at Saint Vincent and Pokegama Falls, 2d; greatest monthly range, 79, at Saint Vincent; least monthly range, 46, at Farmington and Grand Meadow.

**Precipitation.**—Greatest monthly, 0.53, at Rolling Green; least monthly, 0.05, at Crookston and Moorhead.

**Wind.**—Prevailing direction, northwest.—*John Healy, Corporal, Signal Corps, Minneapolis, in charge.*

## MISSISSIPPI.

**Temperature.**—The mean was 2.9 above the normal; maximum, 81, at Vaiden, 5th; minimum, 19, at Louisville, 28th; greatest monthly range, 60, at Vaiden; least monthly range, 42, at Rienzi.

**Precipitation.**—The average was 1.99 below the normal; greatest monthly, 6.30, at Bay Saint Louis; least monthly, 1.75, at Moss Point.—*R. B. Fulton, Signal Corps, University, director.*

## METEOROLOGICAL REPORT OF THE MISSOURI STATE BOARD OF AGRICULTURE.

**Temperature.**—The mean was about 7.0 above the normal; maximum, 76, at Protom, 1st; minimum, -3, at Cassville, 8th; greatest monthly range, 74, at Protom; least monthly range, 40, at Austin.

**Precipitation.**—The average varied from about normal in the southern portion to about 2.00 below in the northern portion; greatest monthly, 2.91, at Cairo, Ill.; least monthly, trace, at Conception and Pickering.—*Levi Chubbuck, Secretary of State Board of Agriculture, Columbia, director; A. L. McRae, Sergeant, Signal Corps, assistant.*

## NEBRASKA.

**Temperature.**—Maximum, 82, at Weeping Water; minimum, -6, at West Point.

**Precipitation.**—In the central part of the state no precipitation or only a trace fell, and it did not exceed 0.50, except at Kimball and Franklin.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Sergeant, Signal Corps, assistant.*

## NEVADA.

**Temperature.**—The mean was 0.5 below the normal; maximum, 73, at El Dorado Canyon, 2d; minimum, 0, at Pioche, 8th; greatest monthly range, 60, at Ely; least monthly range, 27, at Candelaria.

**Precipitation.**—The average was 1.21 below the normal; greatest monthly, 3.55, at Lewer's Ranch; least monthly, 0.16, at Eureka.

**Wind.**—Prevailing direction, southwest.—*Prof. Charles W. Friend, Carson City, director; D. C. Grunow, Corporal, Signal Corps, assistant.*

## NEW ENGLAND METEOROLOGICAL SOCIETY.

**Temperature.**—The mean was 6.3 below the normal; maximum, 58, at Plymouth, 21st; minimum, -36, at Orono, 31st; greatest monthly range, 83, at Orono; least monthly range, 40, at Northampton.

**Precipitation.**—The average was 0.56 above the normal; greatest monthly, 6.16, at Kingston; least monthly, 1.75, at New Hartford.

**Wind.**—Prevailing direction, northwest.—*Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; J. Warren Smith, Private, Signal Corps, assistant.*

## NEW JERSEY.

**Temperature.**—The mean was 1.6 below the normal; maximum, 56, at Bridgeton, 23d; minimum, 3, at Tenaflly, 30th; greatest monthly range, 46, at Tenaflly; least monthly range, 30, at Ocean City.

**Precipitation.**—The average was 0.27 above the normal; greatest monthly, 5.74, at Oceanic; least monthly, 2.34, at Lambertville.

**Wind.**—Prevailing direction, northwest.—*E. W. McGann, Sergeant, Signal Corps, New Brunswick, in charge.*

## NEW YORK.

**Temperature.**—Maximum, 54, at New York City, 8d, and at Setauket, 4th; minimum, -19, at Ampersand, 3d and 20th; greatest monthly range, 59, at Madison Barracks; least monthly range, 31, at Arkwright.

**Precipitation.**—Greatest monthly, 6.74, at Turin; least monthly, 0.58, at Fort Niagara.

**Wind.**—Prevailing direction, northwest.—*Prof. E. A. Fuertes, Dean of the College of Civil Engineering, Cornell University, Ithaca, director; R. M. Hardinge, Private, Signal Corps, assistant.*

## NORTH CAROLINA.

**Temperature.**—The mean was 1.5 above the normal; maximum, 74, at Wilmington, 7th; minimum, 10, at Franklin, 14th; greatest monthly range, 56, at Franklin; least monthly range, 13, at Hatteras.

**Precipitation.**—The average was 1.26 below the normal; greatest monthly, 6.01, at Hatteras and Norfolk, Va.; least monthly, 0.61, at Wilmington.

**Wind.**—Prevailing direction, northwest.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Sergeant, Signal Corps, assistant.*

## NORTH AND SOUTH DAKOTA.

**Temperature.**—The mean was about 9.0 above the normal; maximum, 75,

at Rapid City, S. Dak., 10th; minimum, -25, at Grand Forks, N. Dak., 2d; greatest monthly range, 78, at Woonsocket, S. Dak.; least monthly range, 55, at De Smet, S. Dak.

**Precipitation.**—The average was about 0.26 below the normal; greatest monthly, 2.28, at Webster, S. Dak.; least monthly, 0.04, at Fort Buford, N. Dak.

**Wind.**—Prevailing direction, northwest.—*S. W. Glenn, Sergeant, Signal Corps, Huron, S. Dak., in charge.*

## OHIO.

**Temperature.**—The mean was 0.9 below the average; maximum, 65, at Portsmouth, 11th; minimum, 3, at Newcomerstown, 8th.

**Precipitation.**—The average was 0.21 deficient; it was 0.13 in excess in the southern section; monthly snowfalls averaged between 10 and 20 inches in the different sections: the greatest in 24 consecutive hours occurred on the 25th and 26th, when from 6 to 10 inches fell in the southern, central, and eastern portions of the state.—*Prof. B. F. Thomas, Columbus, director; C. M. Strong, Sergeant, Signal Corps, secretary and assistant.*

## OREGON.

The characteristics of the month were the excess in temperature and the deficiency in precipitation.

**Temperature.**—The mean was 2.4 above the normal; maximum, 67, at Grant's Pass, 26th; minimum, 0, at Burns, 11th.

**Precipitation.**—The average was 3.20 below the normal; greatest monthly, 8.81, at Astoria; least monthly, trace, at Silver Falls.

**Wind.**—Prevailing direction, south.—*Hon. H. E. Hayes, Master State Grange, Oswego, director; B. S. Pague, Sergeant, Signal Corps, assistant.*

## PENNSYLVANIA.

**Temperature.**—The mean was 2 above the normal; maximum, 59, at Charlesville, 11th; minimum, 11, at Dyberry, 29th; greatest monthly range, 25, at Wilkes Barre; least monthly range, 11, at Grampian Hills.

**Precipitation.**—The average was 1.00 above the normal; greatest monthly, 9.68, at Blue Knob; least monthly, 1.72, at Erie.

**Wind.**—Prevailing direction, northwest.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant.*

## TENNESSEE.

**Temperature.**—The mean was normal; maximum, 76, at Lynnville, 2d; minimum, 14, at Rugby; greatest monthly range, 54, at Hohenwald; least monthly range, 34, at Rogersville.

**Precipitation.**—The average was nearly 1.00 above the normal; greatest monthly, 6.08, at Carthage; least monthly, 2.11, at Fayetteville.

**Wind.**—Prevailing direction, northwest.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

## TEXAS.

**Temperature.**—Maximum, 89, at College Station, 5th; minimum, 10, at Coldwater, 7th.

**Precipitation.**—Greatest monthly, 4.35, at Longview; least monthly, 0.00, at Durham and Epworth.—*D. D. Bryan, Galveston, director; I. M. Cline, Sergeant, Signal Corps, assistant.*

## WISCONSIN.

**Temperature.**—The mean was 8 above the normal; maximum, 58, at Oshkosh, 10th; minimum, -16, at Hayward, 4th.

**Precipitation.**—The average was nearly 1.00 below the normal; greatest monthly, 2.16, at Delevan; least monthly, 0.10, at Saint Paul, Minn.

**Wind.**—Prevailing direction, west.—*R. E. Kerkam, Milwaukee, Sergeant, Signal Corps, in charge.*

*Meteorological record of Army post surgeons, voluntary, and other co operating observers, December, 1890.*

Stations.	Temperature. (Fahrenheit.)				Precip'n.		Stations.	Temperature. (Fahrenheit.)				Precip'n.
	Max.	Min.	Mean.	Max.				Max.	Min.	Mean.	Max.	
<i>Alabama.</i>	0	0	0	Ins.			<i>Arizona—Cont'd.</i>	0	0	0	Ins.	
Bermuda *.....	76	24	52.0	1.35			Ash Canyon.....	68	19	47.1	3.78	
Bessemer.....	65	24	47.0	1.58			Benson.....	68	34	52.4	1.48	
Brewton.....	91	23	58.2	1.70			Bisbee *.....	70	32	48.2	1.99	
Citronelle.....	80	29	55.8	1.71			Calabasas.....	.....	.....	.....	1.95	
Columbiana *.....	69	22	47.9	1.91			Casa Grande.....	87	45	62.3	0.87	
Decatur (1).....	.....	.....	.....	2.47			Chino.....	74	22	45.3	.....	
Double Springs *.....	69	21	47.3	3.97			Chiri Cahua M'ts.....	.....	.....	.....	2.90	
Gadsden.....	.....	.....	.....	4.46			Dragoon *.....	.....	.....	.....	2.01	
Greensborough.....	69	28	48.3	3.37			Dragoon Summit.....	78	32	55.4	0.18	
Livingston (1) *.....	72	24	50.7	1.59			Dos Cabezos *.....	.....	.....	.....	2.31	
Mountain Home.....	73	17	43.1	3.16			Dudleyville.....	.....	.....	.....	1.67	
Mount Willing.....	71	31	49.5	1.50			Engle Pass.....	26	.....	42.4	2.10	
Mt. Vernon B'ks.....	78	23	52.3	1.58			Farley's Camp.....	36	.....	55.5	4.44	
Talladega.....	.....	.....	.....	2.20			Fort Apache.....	66	21	43.2	1.52	
Tusculoosa.....	.....	.....	.....	1.84			Fort Bowie.....	61	24	46.1	2.45	
Tuscumbia (1).....	73	23	45.7	2.61			Fort Grant.....	67	30	48.6	2.01	
Uniontown.....	74	28	52.3	2.47			Fort Huachuca.....	67	27	47.6	2.70	
Valley Head *.....	68	20	42.4	3.84			Fort Lowell.....	83	25	60.6	1.48	
<i>Alaska.</i>							Gila Bend (1) *.....	88	52	60.7	1.10	
Juneau.....	45	10	29.0	6.86			Gila Bend (2).....	82	50	63.6	1.42	
Killisnoo.....	45	16	31.3	3.00			Grand Central Mill.....	.....	.....	.....	1.01	
<i>Arizona.</i>							Holbrook *.....	59	19	38.0	1.82	
Antelope Valley.....	.....	.....	.....	4.34			Lochiel *.....	67	30	47.4	3.45	
Ariz. Canal Co. Dam.....	76	37	57.7	1.71			Maricopa.....	72	40	53.2	2.47	